# Appendix B:

# 404 (1)(b) and Wetland Avoidance Minimization Analysis

## Section 404(b)(1) Analysis

Section 404 of the Clean Water Act authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for the public hearing, for the discharge of dredged or fill material into the Waters of the Unites States at specified disposal sites. The construction of any structure in or over any navigable water of the United States, the excavating from or depositing of material in such waters, or the accomplishment of any other work effecting the course, location, condition or capacity of such waters is unlawful unless the work has been permitted by the Secretary of the Army, acting through the Chief of Engineers.

This section presents an evaluation of wetland impacts and avoidance and minimization measures that follows the Clean Water Act, Section 404(b)(1) guidelines (40 CFR, Part 230, Subparts B-F). Under the Subpart B: Avoidance and Minimization, impacts are classified as avoidable or unavoidable for each alternative. Minimization measures are recommended where applicable. Under Subparts C-F, generalized assessments of impacts are presented.

***40 CFR Part 230 SubPart B:Avoidance and Minimization***

Subpart B requires the analysis of alternative(s) that avoid wetland encroachments. Through this analysis, it must be demonstrated that there are no practicable alternatives to the proposed discharge which would have fewer adverse impacts on the aquatic ecosystem. In addition, Subpart B states that no discharge shall be permitted unless measures have been taken to minimize potential adverse impacts.

Section III of the EA, Project Alternatives, describes in detail the initial steps of the Preliminary Alternatives Analysis, in which alternatives were dismissed or advanced based on their environmental, economic and social impacts as related to the project's purpose and need.

Total avoidance of wetlands in the project area is not practical because it would not meet the project needs and would require extensive impacts to the other resources. Total avoidance would require widening US 202 to the east, thus impacting the Deerhurst community, Lombardy Cemetery and Lombardy Hall, all of which are resources protected by Section 106 of the National Historic Preservation Act of 1966 and Section 4(f) of the US Department of Transportation Act of 1966. Additionally, it would be necessary to eliminate the Route 141 Spur, the Rockland Road connection and West Park Road. By doing so, the Total Avoidance Alternative would not meet the project needs for:

- Decreasing vehicular congestion.
- Improving transportation safety.
- Providing adequate transportation facilities to support the planned study area economic and recreational development.
- Significantly improving transit in the region.

Only the No-Build Alternative would preserve all wetlands in the study area and this alternative does not meet project need.

After the total avoidance alternatives were analyzed, each individual wetland was considered for avoidance and minimization. If avoidance was determined not practical, minimization options were studied at each wetland including confining discharge with steep slopes or retaining walls and minor shifts in the alignment.

***Table 1*** summarizes the avoidance and minimization measures evaluated for each wetland and Avoidance Options A(1) through A(8) are attached. The analysis is provided below:

**Wetlands 2 and 3**: The encroachment of Wetlands 2 and 3 is required as a result of the Rt. 141 Spur Connection between Children's Drive and US 202. Two (2) avoidance options and one (1) minimization option were evaluated for these wetlands. Because of their proximity to each other, the alternatives evaluated would be applicable to both wetland areas.

***Avoidance Option A(1)*** – This option would shift the Rt. 141 intersection with Children's Drive to the south to avoid Wetlands 2 and 3. In doing so, the relocated intersection would result in substandard engineering design and unacceptable level of service (LOS) at Children's Drive because of the proximity of the intersection to Rockland Road. Additionally, shifting the intersection and Rt. 141 Spur to the south would require taking the Ronald McDonald House, two large office buildings and a parking garage on Rockland Road. This option was dismissed for not meeting project needs and excessive community impacts.

***Avoidance Option A(2)*** – This option would connect the Rt. 141 Spur to existing Rockland Road at Children's Drive. As a result, unacceptable traffic LOS and engineering design would occur at the intersection of Children's Drive and Rockland Road and the Rt. 141/Murphy Road and 202 intersection. The design would also not satisfy the separation of local and regional traffic need by maintaining all traffic on Rockland Road. Additionally, property impacts to the Montchanin Assisted Living Center, A.I. duPont, Nemours Historic District, the Murphy House and Bird-Husbands House would result with this alignment. This option was dismissed for not meeting project needs and would cause extensive environmental impacts.

***Minimization Option A(3)*** – With this option, the Rt. 141 Spur would be shifted to the south to minimize impacts to Wetland 2 and would avoid impacts to Wetland 3. As a result, this design would require shifting the entire connection at US 202 to the south requiring realignment of the Foulk Road Connection, West Park Local Road, and the US 202 ramp to the Rt. 141 Spur. It would affect the driveway access and parking at A.I. duPont Hospital. Additional property acquisition from the Nemours Historic District and relocation of the Bird-Husbands House would also be required. Additional wetland impacts would be incurred south of Rockland Road. This option was dismissed for not

meeting project needs and causing additional impacts to community and cultural resources as described in ***Table 1***.

**Wetland 4 (Avoidance Option A4)**: Approximately 0.43 acre of linear impacts to Wetland 4 would result from the widening of US 202 between Murphy Road and Foulk Road. The impact would not affect the functional value of the remaining wetlands. To avoid or minimize impacts to these wetlands, US 202 would need to be shifted up to 35 feet to the east from Rt. 141 at Foulk Road to Pierce Road. By doing so, the alignment would require up to 35 feet of frontage property from Lombardy Hall, a National Historic Landmark, and the potentially eligible Deerhurst community. These properties are protected under Section 4(f) and would be considered to be not prudent. As such, this option was dismissed because of potential Section 4(f) impacts.

**Wetland 5 (Avoidance Option A5)**: The US 202 southbound off-ramp would require encroaching on 0.13 acre of wetlands adjacent to Alapocas Run. Avoiding this impact would necessitate eliminating the ramp and subsequent US 202 southbound access to the Rt. 141 Spur and Foulk Road. By doing so, project safety and congestion needs would not be met and therefore the option was dismissed.

Minimization measures were previously incorporated into the design at this location. The ramp and associated bike lane have been shifted as far to the east as possible to minimize wetland impacts.

**Wetlands 7 and 8 (Avoidance Option A6)**: With the proposed project, relocated Rockland Road would require 0.082 ac of impact to Wetland 8 by discharge of fill associated with the crossing of Alapocas Run. To avoid the impact, relocated Rockland Road would need to be eliminated. This would result in not satisfying the project need to separate local and regional traffic and causing the intersection of the Rt. 141 Spur and West Park Road to fail for LOS. Additionally, the project committee supports a local connection from Rockland Road to West Park Road. As such, this option was dismissed for not meeting project need.

Minimization measures have been incorporated to reduce impacts to Wetlands 7 and 8 (**Minimization Option A7**). The previous alignment for Rockland Road was located to the north and created 0.11 ac of impact on Wetland 7 and 8. The connection was shifted further to the south to avoid the total take of Wetland 7, thereby reducing impacts by 0.03 acre.

**Wetland 19 (Avoidance Option A8)**: The Greenway Trail at this location would effect approximately 0.025 ac of wetlands associated with Master Plan. To avoid or minimize wetland impacts the Trail would need to be shifted to the south to parallel the Rockland Golf Course and use existing Carruthers Lane. This option has been proposed for incorporation into the design and is being further refined to minimize wetland and waterway impacts.

*40 CFR Part 230 Subpart C: Physical and Chemical Characteristics*

Subpart C addresses potential impacts to the physical and chemical characteristics of the aquatic ecosystem.

**230.20 Substrate** – Fill discharges proposed for the project would cause loss of aquatic habitat from both riverine open water and palustrine wetland systems. These impacts would be minimized at the proposed culvert locations by depressing the culverts one foot and stabilizing the stream bed with rip-rap and appropriate fill. Benthic organisms permanently displaced by the proposed fill will be capable of recolonizing in the same system in those areas where fill material affects only a portion of the wetland and/or riverine system.

Potential changes in the substrate elevation and bottom contours will occur only within the proposed cut and fill limits and the proposed culvert locations. Elevation changes outside of the disposal site are not expected to occur as a result of erosion, slumpage, or other movement of the discharged material. An approved Erosion & Control Plan will be required for the project and will address potential substrate disturbance.

**230.21 Suspended Particulates/Turbidity** – The discharge of fill material would temporarily increase suspended particulate levels and create potentially turbid plumes of varying degree. By adhering strictly to sedimentation and erosion control measures, these adverse impacts would be kept to a minimum. In addition, discharge rates and velocities will be kept under control to reduce plume size and the timing of discharge during low water or dry conditions to help minimize plume size.

**230.22 Water** – All fill material discharges would be clean, without chemical constituents that would alter clarity, color, odor or taste of water at or downstream from the disposal site.

**230.23 Current Patterns and Water Circulation** – The discharge will not adversely affect or modify current water patterns and circulation or change the direction and flow of the water. Engineering drainage design features would be incorporated to maintain existing flow patterns, including proper sizing for culverts and bridges and the appropriate use of retention basins with measured releases. Culvert and inlet protection and outfalls will be designed in accordance with procedures contained in the *Hydraulic Design of Energy Dissipaters for Culverts and Channels*, HEC No. 14, U.S. Department of Transportation, Federal Highway Administration.

**230.24 Normal Water Fluctuations** – Impacts to normal water fluctuations would not occur with proper stormwater management and engineering drainage design features. It is not anticipated that any of the wetland or waterway encroachments would alter the normal water level fluctuations. Culvert crossings

will be designed to standards ensuring that no upstream flooding from backwater effects of the encroachment would occur. Preliminary hydraulic analyses indicate there is no increase on flood hazard potential. In addition, the hydrology of the existing wetlands and riverine systems will be maintained following the discharge of fill so that no water level patterns modifications would occur that adversely affect the adjacent wetland areas.

**230.25 Salinity Gradients** – Not applicable to this project.

***40 CFR Part 230 Subpart D: Biological Characteristics of Aquatic Ecosystems***

Subpart D addresses potential impacts to the biological characteristics of the aquatic ecosystem.

**230.30 Threatened and Endangered Species** – No federally or state listed threatened or endangered species nor any species being considered for federal listing were found within the project study area.

**230.31 Aquatic Organisms in the Food Web** – Temporary, minor impacts would occur to aquatic organisms in the food web. Organism populations would be reduced as a result of activities such as the placement of fill in the aquatic systems. Where hydrologic interaction with unaffected aquatic areas is maintained, areas such as those covered by siltation and new channels would readily develop conditions favorable to re-population. Other impacted areas will also develop at least some favorable conditions with time. However, the number and type of organisms which establish populations is dependent on variables such as available sun light, temperature, water velocity, available oxygen, etc. In order to limit the change in the populations, impacts would be mitigated through the replacement of like habitat to the best extent possible. It is expected the benthic organism populations would be capable of recolonizing in the areas adjacent to the impact following any temporary disturbance from the fill deposition.

The impacts to the aquatic organisms would not permanently affect the aquatic ecosystem of the study area. The amount of impact is relatively small compared to the overall size of the aquatic systems within the study area. Combining this with the replacement of the impacted areas, there would be minimal impact in the availability of aquatic organisms needed to support the aquatic food chain.

**230.32 Other Wildlife** – Moderate impacts to wildlife habitat would occur with filling of the wetlands, primarily birds, reptiles, and amphibians. Generally, the loss of forestland would not adversely affect the availability of similar habitat in the study area nor the wildlife species utilizing this cover type for food, nesting and resting sites. These impacts would be mitigated through the replacement of wetland habitat.

*40 CFR Part 230 Subpart E: Special Aquatic Sites*

Subpart E addresses potential impact to special aquatic sites. Individual components of Subpart E is as follows:

**230.41 Wetlands** – Direct impacts to 1.12 acres of wetlands would occur with the Preferred Alternative. The impacts, avoidance analysis and minimization measures are discussed previously in this section. Mitigation discussion follows this section.

**230.45 Riffle and Pool Complexes** – Riffle and pool complexes were identified at a few locations along Alapocas Run. Predominantly, the riffle and pool complexes were located at the northern positions of watercourse where much scouring and erosion action has occurred. The lower portion of the watercourses to be affected are generally level and do not contain significant riffle and pool complexes that would be adversely affected by the proposed fill. Minimization of adverse effects on the aquatic habitat would include avoiding changes in the water current or circulation patterns by proper planning and construction practices.

*40 CFR Part 230 Subpart F: Human Use Characteristics*

Subpart F addresses potential impacts to human use characteristics. A few of these components are discussed in other sections of the document as referenced. Each component is addressed below as follows:

**230.50 Municipal and Private Water Supplies** – The Porter Reservoir is municipal public water supply located within the project study area on the east side of US 202 between Foulk Road and the I-95 Interchange. The Porter Reservoir will not be impacted by the project as it relates to characteristics. Public water supply pipe lines are also currently located under US 202 and will be coordinated with the municipal authorities where relocation is required. No other public or private supplies were identified within close proximity to the project.

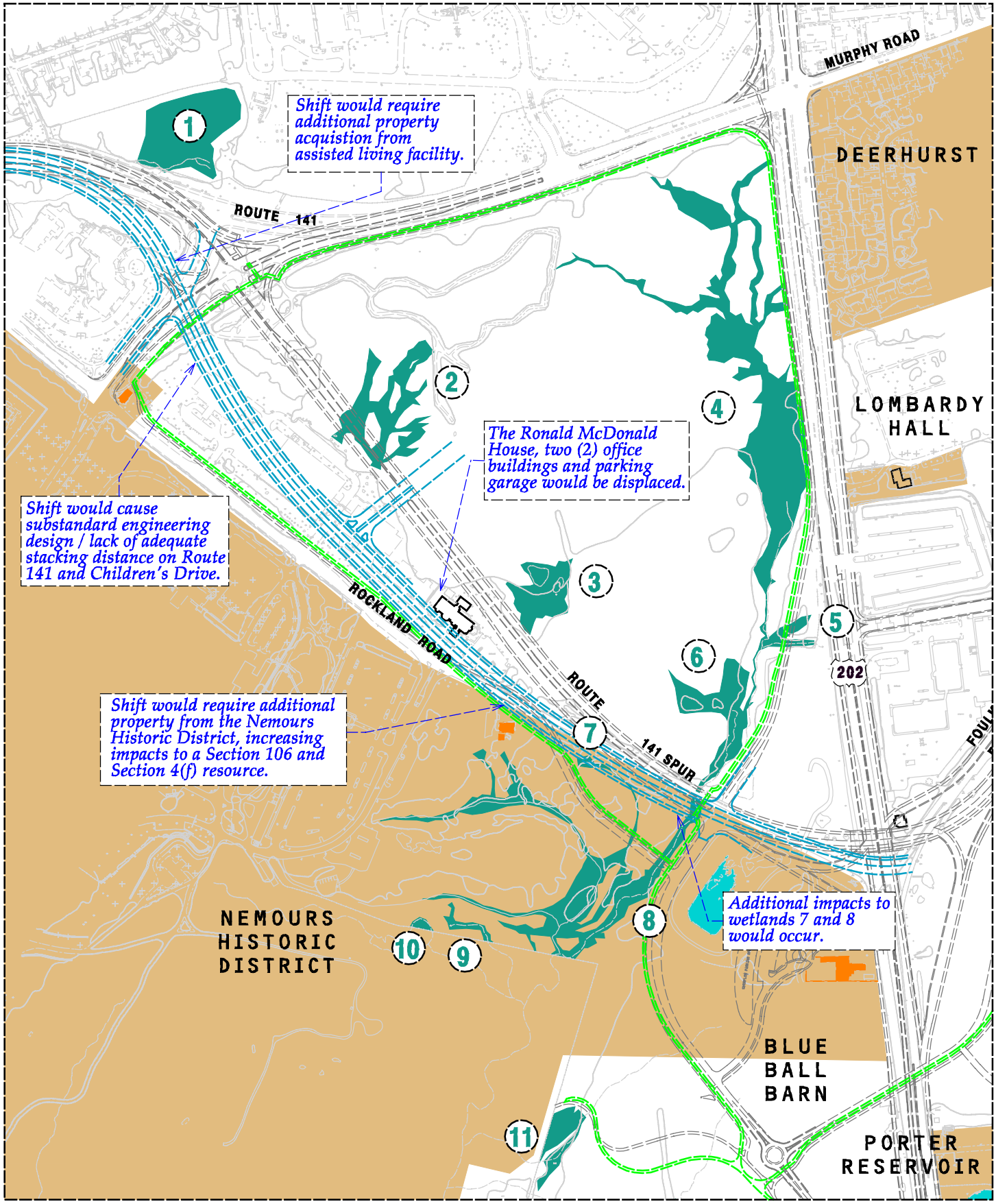
**230.51 Recreation and Commercial Fisheries** – No recreational or commercial fisheries were located along the waterways in the study area.

**230.52 Water-Related Recreation** – Same as Section 230.51.

**230.53 Aesthetics** – Impacts to aesthetics would be minimized through proper design techniques. The West and East Side Park Roads will traverse the proposed recreational areas and be enhanced by a bike lanes, berms and proper fencing. Landscaping and special interpretive signing is being proposed throughout the recreational areas.

**230.54 Features** – Traces of the area's history and heritage are found in the project study area in the form of historic and archaeological resources. A part of

this heritage exists in the remains of the Nemours District and Weldin plantation. The MOA prepared for the project outlines the mitigation measures to be incorporated to help preserve these features or mitigate adverse effects upon these features and others; identified within the APE.

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JUNE, 2001

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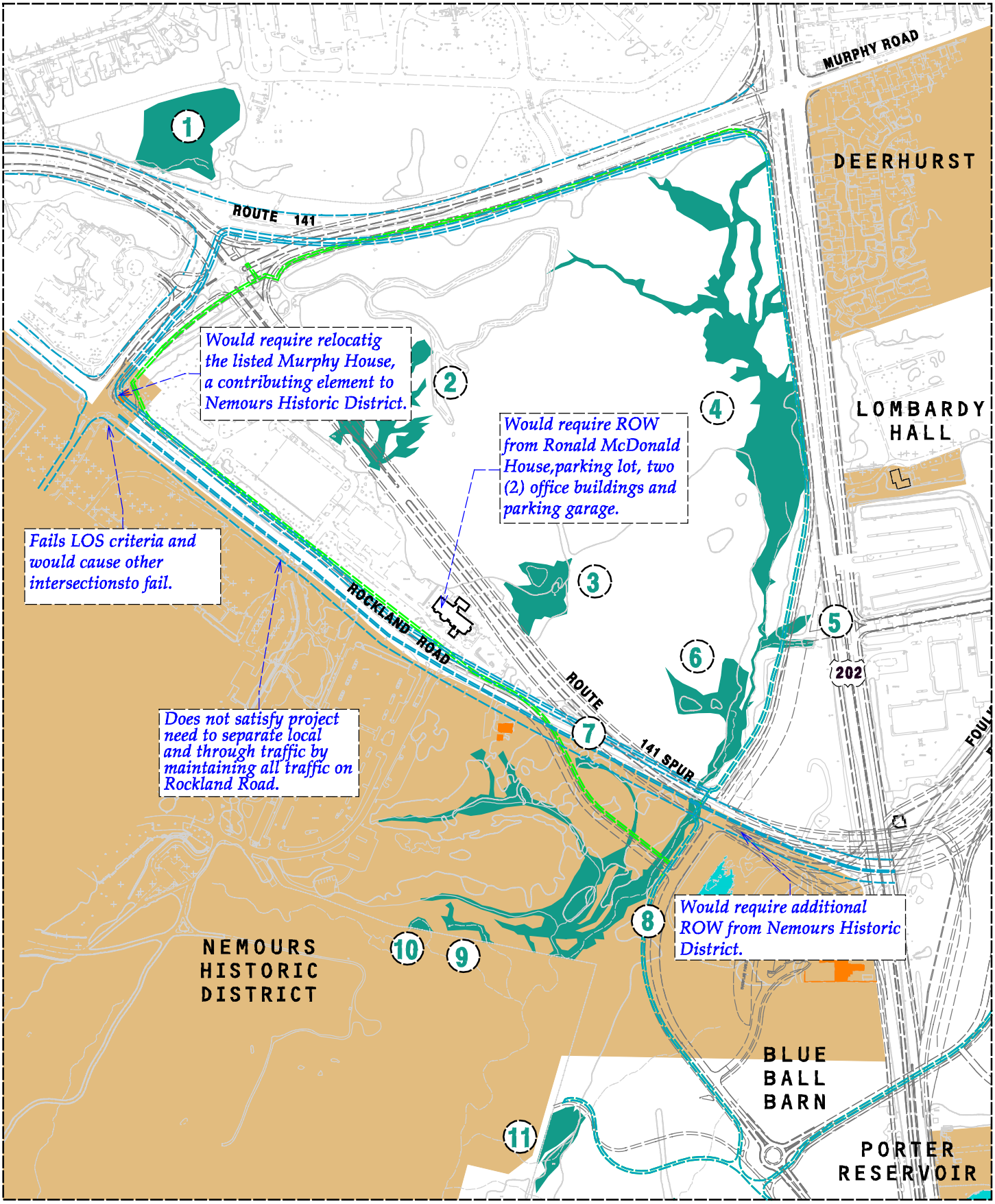
SCALE IN FEET

**LEGEND**

- WETLANDS
- SECTION 4(F) RESOURCE
- HISTORIC DISTRICT CONTRIBUTING ELEMENT
- AVOIDANCE ALIGNMENT
- MASTER PLAN MODIFIED (OPTION A)
- GREENWAY TRAIL

# WETLAND AVOIDANCE OPTION A1 : Shift Route 141 intersection to the south.




**LEGEND**

- WETLANDS
- SECTION 4(F) RESOURCE
- HISTORIC DISTRICT CONTRIBUTING ELEMENT
- AVOIDANCE ALIGNMENT
- MASTER PLAN MODIFIED (OPTION A)
- GREENWAY TRAIL

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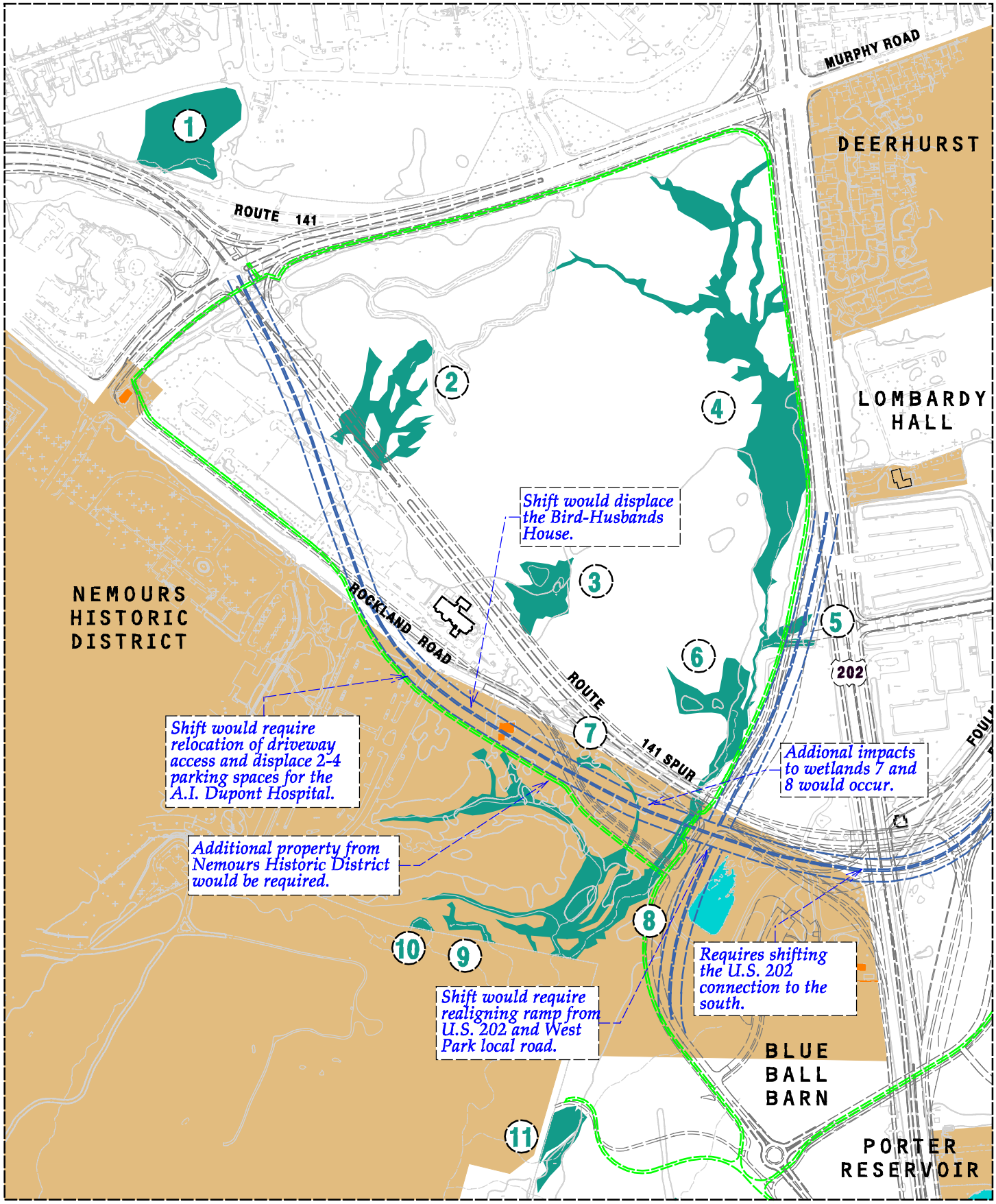
# WETLAND AVOIDANCE OPTION A2 :

**Connect Route 141 to existing Rockland Road at Children's Drive.**




**LEGEND**

- WETLANDS
- SECTION 4(F) RESOURCE
- HISTORIC DISTRICT CONTRIBUTING ELEMENT
- AVOIDANCE ALIGNMENT
- MASTER PLAN MODIFIED (OPTION A)
- GREENWAY TRAIL

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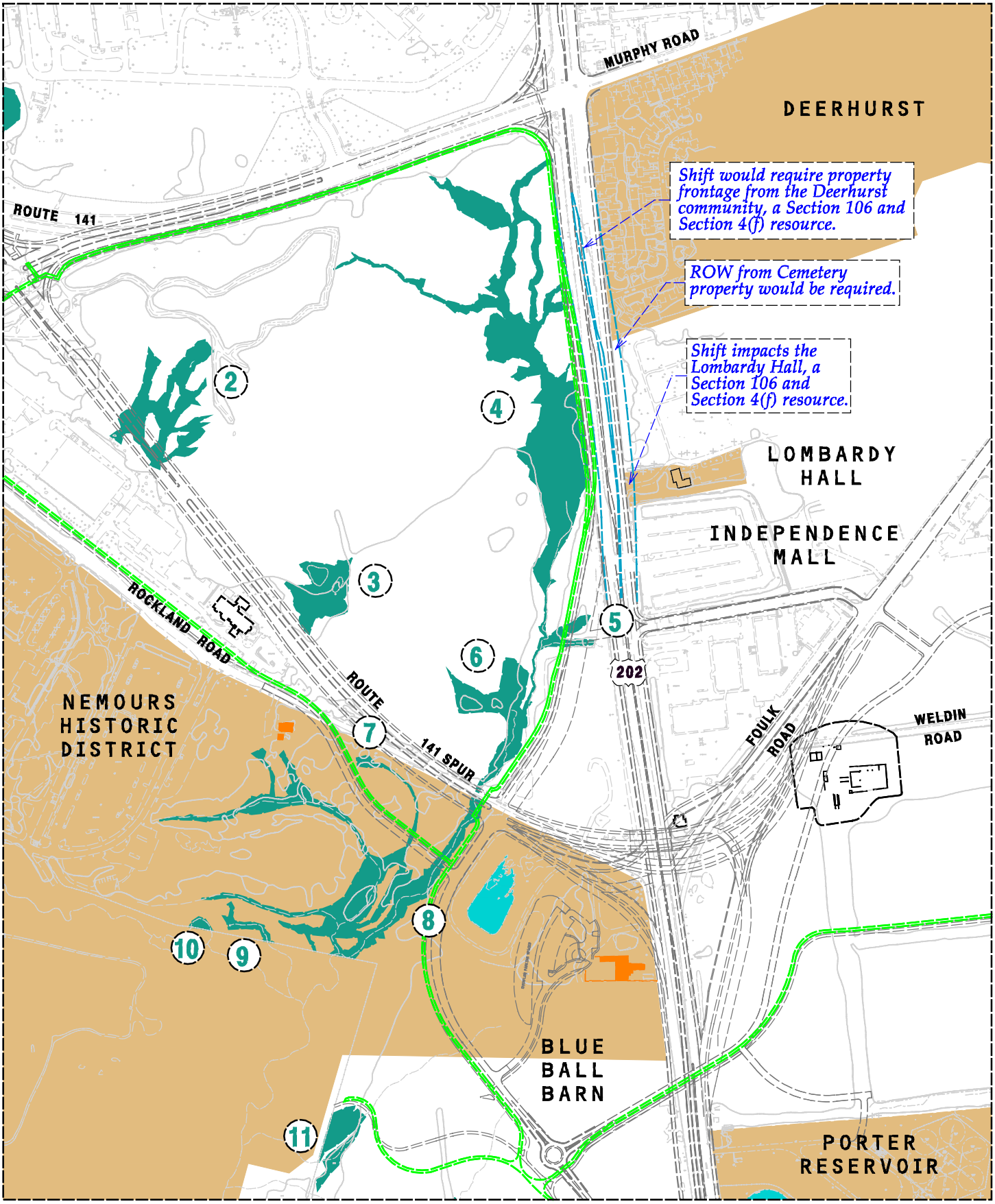
# WETLAND MINIMIZATION OPTION A3 : Shift Route 141 Spur to the south and connect with Rockland Road.

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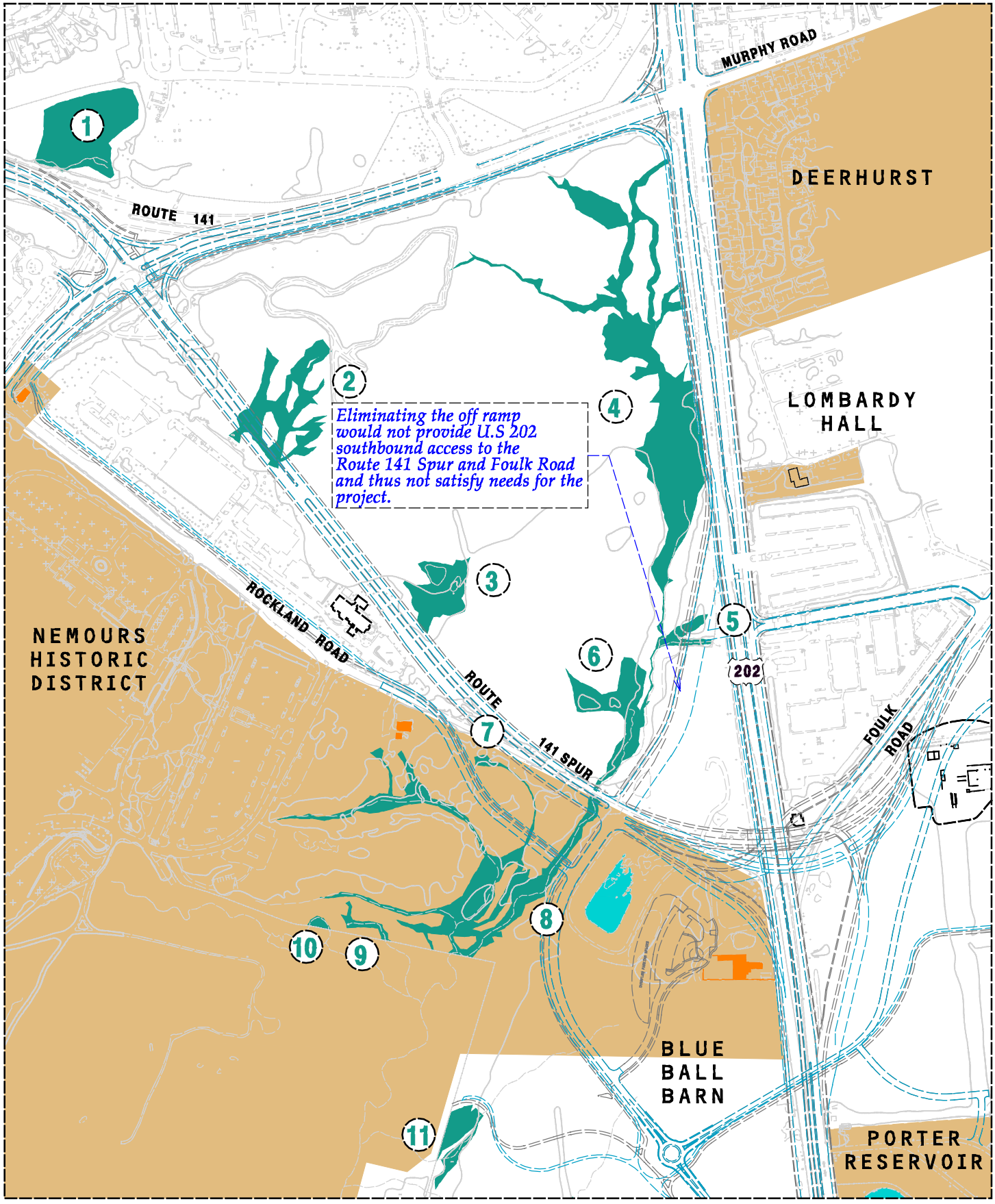
SCALE IN FEET

**LEGEND**

- WETLANDS
- SECTION 4(F) RESOURCE
- HISTORIC DISTRICT CONTRIBUTING ELEMENT
- AVOIDANCE ALIGNMENT
- MASTER PLAN MODIFIED (OPTION A)
- GREENWAY TRAIL

# WETLAND AVOIDAN OPTION A4 :

**Shift U.S. 202 Alignment to the east.**




**LEGEND**

- WETLANDS
- SECTION 4(F) RESOURCE
- HISTORIC DISTRICT CONTRIBUTING ELEMENT
- AVOIDANCE ALIGNMENT
- MASTER PLAN MODIFIED (OPTION A)
- GREENWAY TRAIL

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SCALE IN FEET

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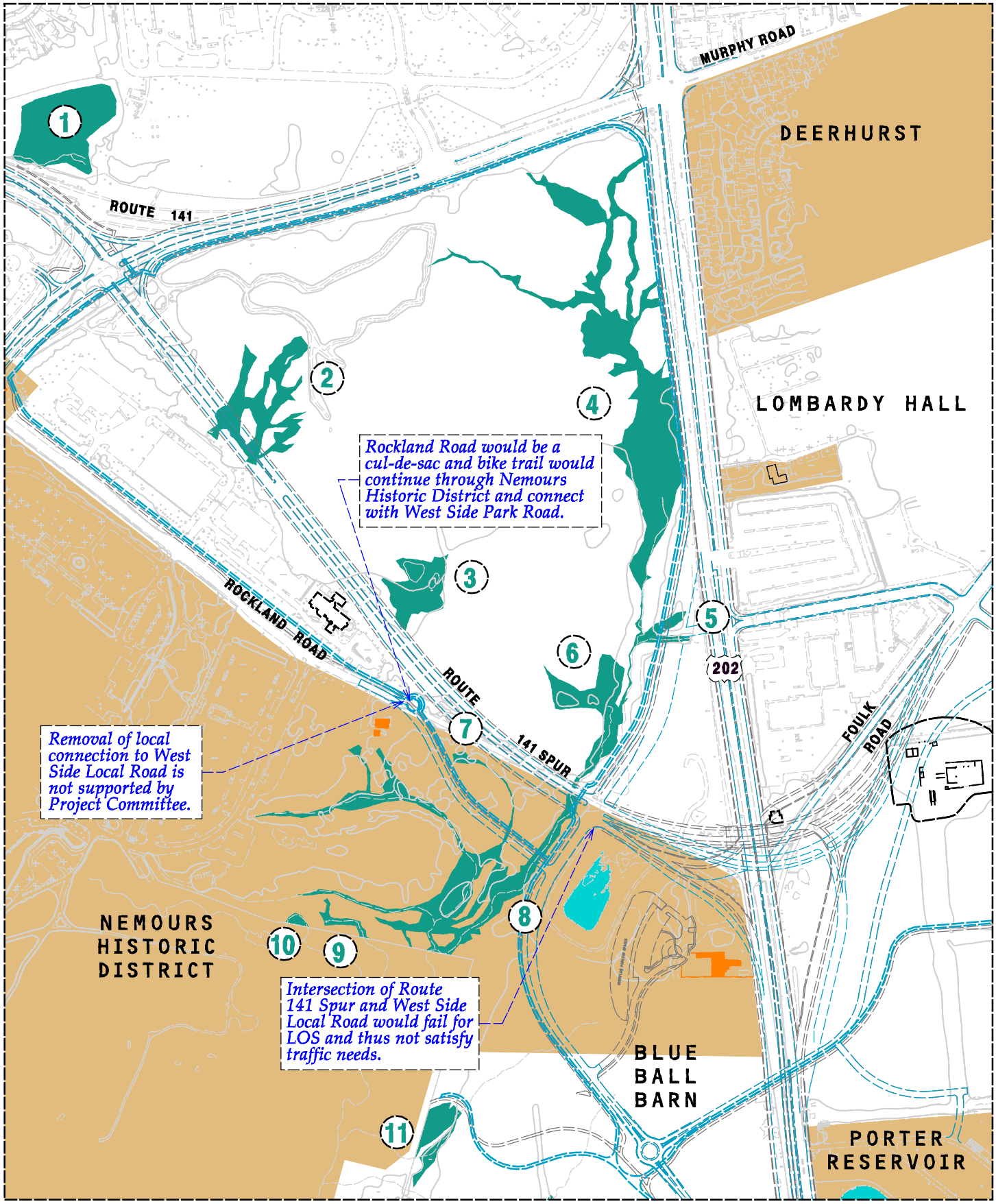
# WETLAND AVOIDANCE OPTION A5 :

**Eliminate southbound off ramp for U.S. 202 at Route 141 spur.**




**LEGEND**

- WETLANDS
- SECTION 4(F) RESOURCE
- HISTORIC DISTRICT CONTRIBUTING ELEMENT
- AVOIDANCE ALIGNMENT
- MASTER PLAN MODIFIED (OPTION A)
- GREENWAY TRAIL

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SCALE IN FEET

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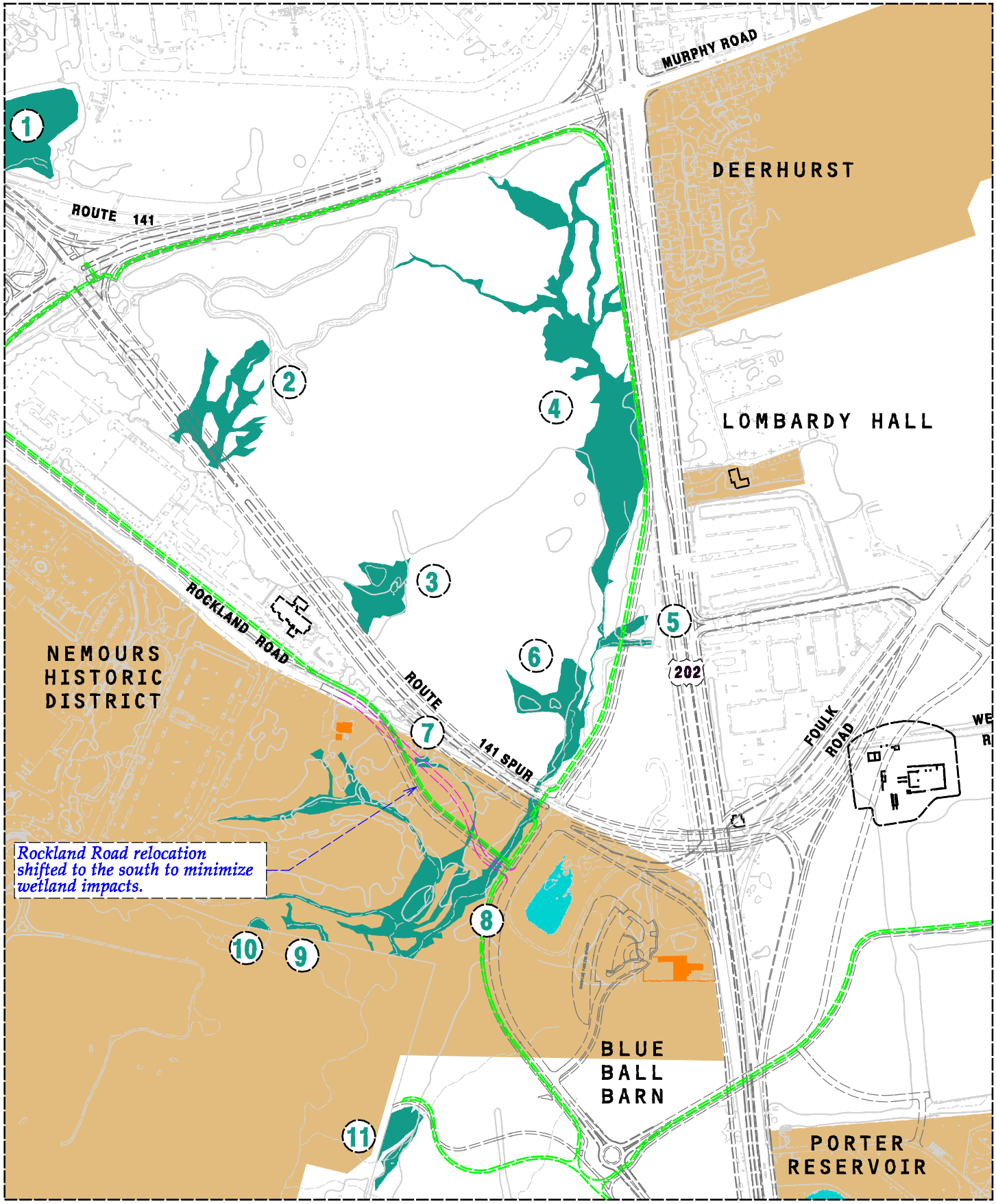
# WETLAND AVOIDANCE OPTION A6 :

## Eliminate Rockland Road connection to West Side Local Road.




**LEGEND**

- WETLANDS
- SECTION 4(F) RESOURCE
- HISTORIC DISTRICT CONTRIBUTING ELEMENT
- AVOIDANCE ALIGNMENT
- MASTER PLAN MODIFIED (OPTION A)
- GREENWAY TRAIL
- OLD ALIGNMENT

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SCALE IN FEET

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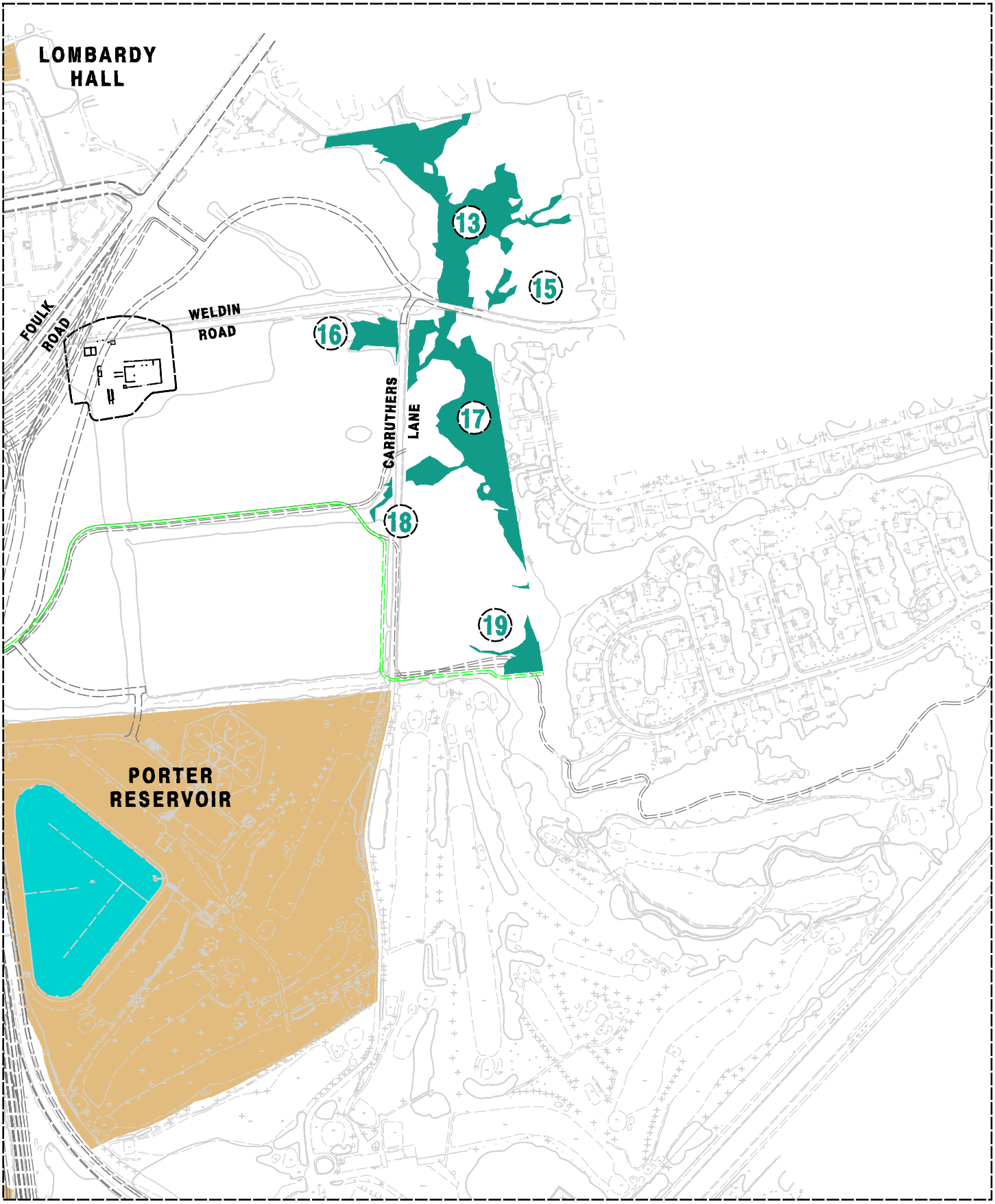
# WETLAND MINIMIZATION OPTION A7 :

## Shift Rockland Road connection to the south.

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JUNE, 2001

N

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SCALE IN FEET

**LEGEND**

- WETLANDS
- SECTION 4(F) RESOURCE
- HISTORIC DISTRICT CONTRIBUTING ELEMENT
- AVOIDANCE ALIGNMENT
- MASTER PLAN MODIFIED (OPTION A)
- GREENWAY TRAIL

# WETLAND AVOIDANCE OPTION A8 :

**Shift Greenway Trail to the southwest.**

# Blue Ball Properties Area Transportation Improvement Plan
# Wetland Avoidance and Minimization
# TABLE 1

| RESOURCE | PORTION OF TRANSP. IMPROVEMENT AFFECTING RESOURCE | CHARACTERIZE EFFECTS | OPTIONS | | CONSEQUENCES | | CONCLUSION |
|---|---|---|---|---|---|---|---|
| | | | AVOIDANCE OPTIONS | MINIMIZATION OPTIONS | FEASIBILITY (ENG. & TRAFFIC) | ENVIRONMENTAL & SOCIAL CONSIDERATIONS | |
| **WETLAND / AQUATIC RESOURCES** | | | | | | | |
| **Wetlands 2 and 3** | ▪ Rt. 141 Spur | ▪ 0.45 ac of wetland impact. | ▪ **Option A1:** Shift Rt. 141 Spur to the south to avoid Wetlands 2 and 3. | | ▪ Would result in substandard left turn stacking distance at Childrens Drive. | ▪ Shifting to avoid impacts to the wetlands would require taking the Ronald McDonald House, two office buildings and a parking garage along Rockland Road.<br>▪ Additional impacts to the Nemours Historic District and Murphy House, a contributing element.<br>▪ Additional property takes at Montchanin Assisted Living Community. | ▪ Results in excessive environmental, historic and social impacts. |
| | | | ▪ **Option A2:** Connect Rt. 141 Spur to existing Rockland Road at Children's Drive. | | ▪ Fails LOS criteria and would cause other intersections to fail.<br>▪ Does not satisfy separation of local and regional traffic need. | ▪ Would require additional property frontage from the Nemours Historic District.<br>▪ Would require property frontage from the Ronald McDonald House and an office complex.<br>▪ Would require relocating the Murphy House (a contributing element to the Nemours Historic District). | ▪ Does not meet project needs and results in additional environmental impacts to community ando historic resources. |
| | | | ▪ **Option A3:** Maintain interchange Rt. 141 and Childrens Drive. | | ▪ Would require shifting the entire connection at US 202 to the south requiring realignments of Foulk Road connection, West Side Park Road and the US 202 ramp to Rt. 141 Spur. | ▪ Would require additional property from Nemours Historic District.<br>▪ Would require relocating driveway access and displacing 2-4 parking spaces at A.I. duPont Hospital.<br>▪ Would require relocating the Bird-Husbands House.<br>▪ Would require additional wetland impacts north and south of Rockland Road along Alapocas Run.<br>▪ Would isolate access to AstraZeneca's southern campus from the Rt. 141 Spur. | ▪ Does not meet project needs and results in additional environmental impacts to historic resources. |

# Blue Ball Properties Area Transportation Improvement Plan
# Wetland Avoidance and Minimization
# TABLE 1

| RESOURCE | PORTION OF TRANSP. IMPROVEMENT AFFECTING RESOURCE | CHARACTERIZE EFFECTS | OPTIONS | | CONSEQUENCES | | CONCLUSION |
|---|---|---|---|---|---|---|---|
| | | | AVOIDANCE OPTIONS | MINIMIZATION OPTIONS | FEASIBILITY (ENG. & TRAFFIC) | ENVIRONMENTAL & SOCIAL CONSIDERATIONS | |
| **Wetland 4** | ▪ Widening of U.S. 202 | ▪ .43 ac of impact to wetlands. | ▪ **Option A4:** Shift Rt. 202 an average of 35 feet to the east between Independence Mall and Murphy Road. | | Would require 35 ft. of property frontage from a National Landmark and the National Register eligible Deerhurst community. | | Environmental impacts to a National Landmark and an eligible historic district requiring Section 4(f) Evaluation. |
| **Wetland 5** | ▪ West Park Road | ▪ .10 ac of impact to wetlands. | ▪ **Option A5**: Do not build Ramp C-southbound off-ramp. | ▪ Steepen slopes along Ramp C.<br>▪ At this location, Ramp C and associated bike lane has been shifted as far to the east as possible to avoid impacts to the wetlands. | ▪ Does not meet safety and congestion needs for the project by eliminating the US 202 southbound connection to Rt. 141 and Foulk Road.<br>▪ Does not allow all movements at all locations needed for the interchange to function adequately. | ▪ As a result of minimization, there are reduced wetland impacts at Wetland 5 and avoidance at wetland 6. | ▪ Does not meet needs for the project. |
| **Wetland 8** | ▪ Relocated Rockland Road | ▪ .08 ac of impact to wetlands. | ▪ **Option A6:** Do not incorporate Rockland Road connection into roadway design. | | ▪ Intersection of Rt. 141 Spur and West Side Local Road would fail for LOS. | ▪ Avoids wetland impacts. | ▪ Does not meet project needs. |
| | | | | ▪ **Option A7:** Shift alignment to the south to reduce wetland impacts and steepen slopes along Rockland Road. Additional minimization measures that reduced impacts to Alapocas Run included providing an open bottom culvert, minimizing disturbance from rip-rap and plunge pools and enhancing bank area with proposed plantings. | | ▪ Reduces wetland by 0.02 ac. and minimizes in-stream impacts to the aquatic biota and integrity of the streambed. | ▪ * Incorporated into design. |